

CLAIMS

1. A pattern transfer apparatus for putting a transfer die having a concavo-convex pattern against a transfer target on a substrate to transfer the concavo-convex pattern onto a surface of said transfer target,

the apparatus comprising pressing means for pressing said transfer die against said transfer target on said substrate at a plurality of different locations independently.

2. The pattern transfer apparatus according to claim 1, wherein: at least part of said transfer die is made of a ferromagnetic material; said pressing means includes magnetic force generating means for generating a magnetic force, being provided to near said substrate; and said magnetic force generating means applies a magnetic force to said transfer die with said substrate interposed therebetween, thereby pressing said transfer die against said substrate.

3. The pattern transfer apparatus according to claim 2, wherein said magnetic force generating means includes at least two or more electromagnets.

4. The pattern transfer apparatus according to claim 3, wherein said pressing means includes a current controller for adjusting the amounts of current to flow through said electromagnets, respectively.

5. The pattern transfer apparatus according to claim 4, comprising: measuring means for measuring a distance between said substrate and said transfer die in at least two or more

measuring points; and control means for receiving signals on the measuring points and the measured distances from said measuring means, determining currents to be applied to said respective electromagnets so that the measured distances at the measuring points become a predetermined value, and transmitting a signal to said current controller.

6. The pattern transfer apparatus according to claim 3, wherein said magnetic force generating means has: at least two or more permanent magnets; and magnetic force adjustable means for changing magnetic forces to reach said transfer die from said permanent magnets.

7. The pattern transfer apparatus according to claim 6, wherein said magnetic force adjustable means includes moving means for moving said permanent magnets.

8. The pattern transfer apparatus according to claim 7, comprising: measuring means for measuring a distance between said substrate and said transfer die in at least two or more measuring points; and control means for receiving signals on the measuring points and the measured distances from said measuring means, determining a distance between said magnets and said transfer die so that the measured distances at the measuring points become a predetermined value, and transmitting a signal to said moving means.

9. The pattern transfer apparatus according to claim 1, wherein said pressing means includes a plurality of pressure cylinders.

10. The pattern transfer apparatus according to claim 9,

wherein said pressing means includes a pressure controller for adjusting pressures of said pressure cylinders.

11. The pattern transfer apparatus according to claim 10, comprising: measuring means for measuring a distance between
5 said substrate and said transfer die in at least two or more measuring points; and control means for receiving signals on the measuring points and the measured distances from said measuring means, determining the pressures of said respective pressure cylinders so that the measured distances at the
10 measuring points become a predetermined value, and transmitting a signal to said pressure controller.

12. The pattern transfer apparatus according to any one of claims 5, 8, and 11, wherein said measuring means is a distance measuring device using laser reflection.

13. The pattern transfer apparatus according to any one of
15 claims 5, 8, and 11, wherein said measuring means is a distance measuring device using ultrasonic reflection.

14. The pattern transfer apparatus according to any one of
20 claims 5, 8, and 11, wherein said measuring means is a distance measuring device using a change in capacitance.

15. The pattern transfer apparatus according to claim 2, comprising second pressing means for pressing said transfer die against a transfer target on said substrate uniformly.

16. The pattern transfer apparatus according to claim 15,
25 wherein said second pressing means includes: pressure applying means; and a balloon for transmitting a pressure of said pressure applying means to said transfer die.

17. A pattern transfer method for putting a transfer die having a concavo-convex pattern against a transfer target on a substrate to transfer said concavo-convex pattern onto a surface of said transfer target,

5 the method comprising:

a uniform pressing step of pressing said transfer die against said transfer target on said substrate uniformly; and

a nonuniform pressing step of pressing said transfer die against said transfer target on said substrate at a plurality
10 of different locations independently.

18. The pattern transfer method according to claim 17, comprising the step of arranging said transfer die in parallel with said substrate prior to the uniform pressing step.

19. The pattern transfer method according to claim 17,
15 wherein the nonuniform pressing step includes the step of increasing a force for pressing said transfer die against said substrate, with an increasing distance between said substrate and said transfer die.

20. The pattern transfer method according to claim 17,
20 wherein the nonuniform pressing step includes the step of making a force for pressing a distorted area of said transfer die against said substrate greater than with other areas.

21. The pattern transfer method according to claim 17, wherein the nonuniform pressing step includes the step of
25 applying a force for pressing said transfer die against said substrate to only a distorted area of said transfer die.

22. The pattern transfer method according to claim 17,

further comprising a measuring step of measuring a distance between said substrate and said transfer die in at least two or more measuring points, and wherein the nonuniform pressing step includes applying locally different pressing forces so
5 that the distance measurements obtained from the measuring points in the measuring step become a predetermined value.